Grade 12
Pre-Calculus Mathematics
Achievement Test

Booklet 2

January 2014

Manitoba

Disponible en français.

Available in alternate formats upon request.

Instructions

Multiple-Choice Questions

- There are 10 questions each worth one mark.

- Calculators are **not** allowed for this part of the test.

- You may use the spaces beside each question for rough work.

- Provide only one answer per question.

- There is no penalty for guessing.

- Record your answers on the sheet provided.

Short and Long Answer Questions

- There are 19 questions worth a total of 47 marks.

- Calculators are **not** allowed for this part of the test.

- For full marks, your answer must show all pertinent diagrams, calculations, and explanations.

- Your solutions should be neat, clear, and well organized.

- Write each solution in the space provided.

No marks will be awarded for work done on this page.

Unit Circle (can be used if needed)
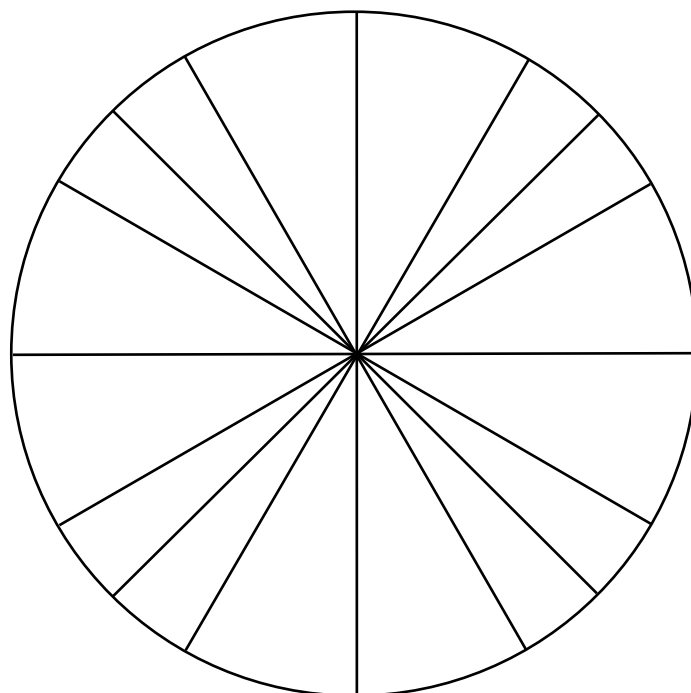
If the point $(4, -3)$ lies on the graph of $f(x)$, which point must lie on the graph of $2f(2x)$?

a) $(8, -6)$ b) $(2, -6)$ c) $\left(8, -\dfrac{3}{2}\right)$ d) $\left(2, -\dfrac{3}{2}\right)$

The graph of $y = \log_2(2x + 6)$ intersects the graph of $y = 4$ at:

a) $x = -1$ b) $x = 1$ c) $x = 5$ d) $x = 14$

Given the point $A(-3, 5)$ on the terminal arm of an angle θ, identify the value of $\cot \theta$.

a) $-\dfrac{3}{5}$ b) $-\dfrac{5}{3}$ c) $-\dfrac{4}{5}$ d) $-\dfrac{5}{4}$

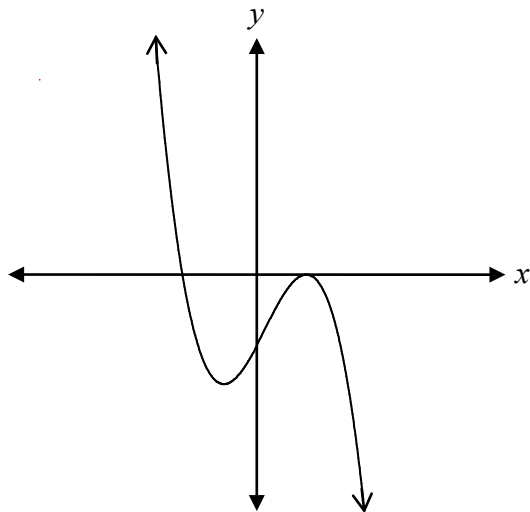## Question 19   1 mark

The graph of $y = \left(\dfrac{1}{2}\right)^x$ compared to the graph of $x = \left(\dfrac{1}{2}\right)^y$ is a:

a) reflection in the x-axis

b) reflection in the y-axis

c) reflection in the line $y = x$

d) reciprocal function

Question 20   1 mark

Given the above graph of a polynomial function, which one of the following statements can be true?

a) The function has a degree of 4 with a positive leading coefficient.

b) The function has a degree of 4 with a negative leading coefficient.

c) The function has a degree of 3 with a positive leading coefficient.

d) The function has a degree of 3 with a negative leading coefficient.

Question 21   1 mark

Given that $(x+3)$ is a factor of polynomial $P(x)$, which of the following is true?

a) $P(-3) = 0$ b) $P(0) = -3$ c) $P(0) = 3$ d) $P(3) = 0$
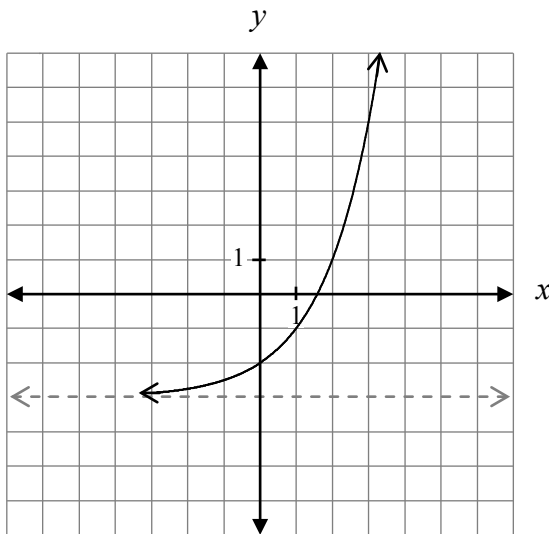
Question 22   1 mark

Which of the following is a reasonable estimate for the value of $\log 350$?

a) 2   b) 2.5   c) 2.8   d) 3

Question 23   1 mark

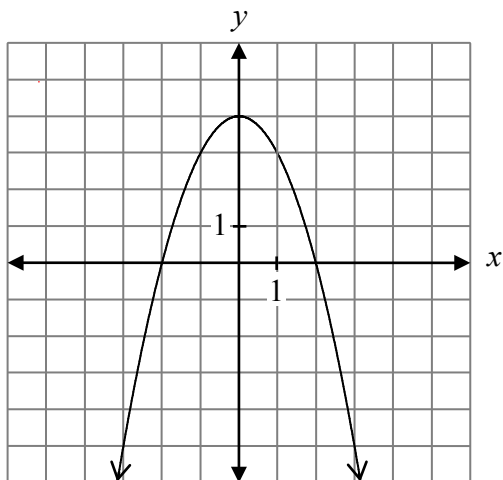The graph of the function $f(x)$ shown below is best described by the equation:

a) $f(x) = 2^{x+3}$ b) $f(x) = 2^{x} + 3$ c) $f(x) = 2^{x-3}$ d) $f(x) = 2^{x} - 3$

Given the graph of $y = f(x)$, what is the domain of $\sqrt{f(x)}$?

a) $x \in \mathbb{R}$ b) $-2 \le x \le 2$ c) $x \le -2$ or $x \ge 2$ d) $0 \le x \le 4$

Question 25   1 mark

Solve:

$$e^{\ln(5-x)} = 7$$

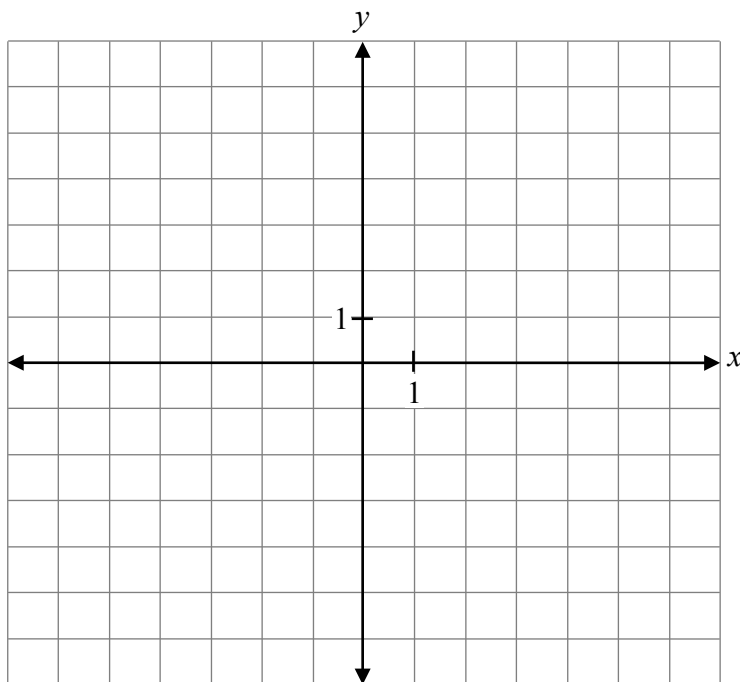a) -2 b) $-\ln 2$ c) $\ln 7 - \ln 5$ d) $\dfrac{7}{5}$

One of the factors of $P(x) = x^3 - kx^2 - 7x + 10$ is $(x - 2)$.

Find the value of k.

a) Sketch the graph of the function $y = \sqrt{-x} + 1$.

b) Determine the value of x when $y = 3$.

Solve the following equation:

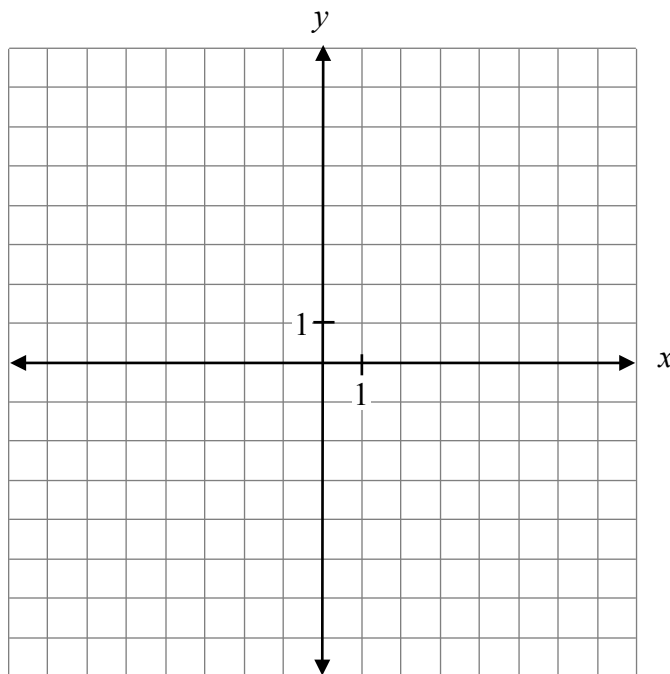$$_nP_2 = {_nC_3}$$

Given $f(x) = x^2 - 1$ and $g(x) = \sqrt{x+1}$, sketch the graph of $y = f(g(x))$ and state its domain.

Domain:_____

1 mark   123

Write the equation of the horizontal asymptote for the function $f(x) = \dfrac{x-3}{x-2}$.

Question 31 **1 mark**   124

The x-intercept of $f(x)$ is 4 and the x-intercept of $g(x)$ is 4.

Benjamin concludes that the x-intercept of $f(x) + g(x)$ is 8.

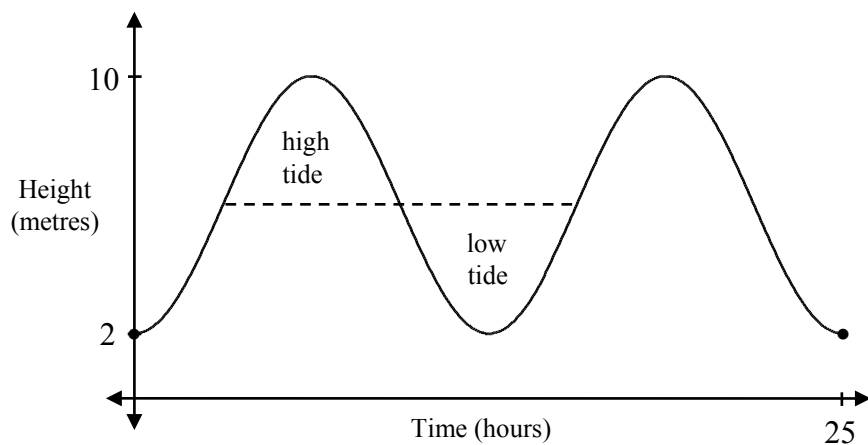Do you agree with Benjamin? Justify your answer.

Solve the following equation:

$$2\log_4 x - \log_4 (x + 3) = 1$$

The following graph represents tidal levels in the Bay of Fundy over a 25-hour period.
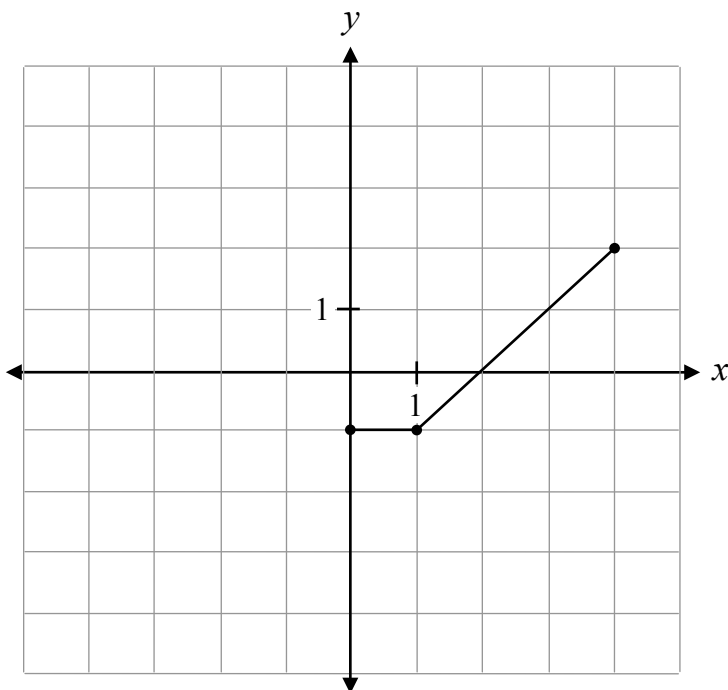

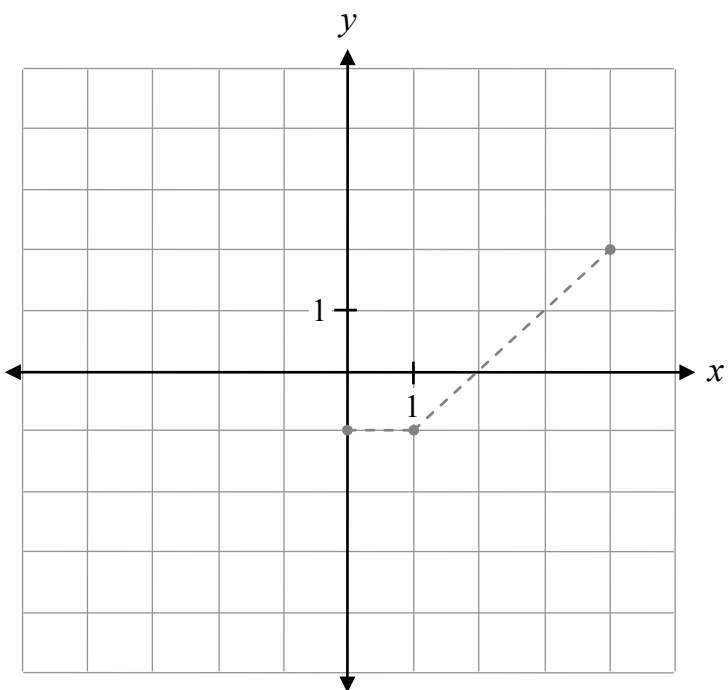a) What is the average height of the water?

b) What is the period of the graph above?
    Explain what the period represents in this situation.

Given the graph of $y = f(x)$ below,

sketch the graph of $y = \sqrt{f(x)}$.

The graph of $f(x)$ has already been drawn for your reference.

No marks will be awarded for the graph of $f(x)$.

Question 35   1 mark

When $P(x)$ is divided by $x - 3$, it has a quotient of $2x^2 + x - 6$ and a remainder of 4.

Determine $P(x)$.

Question 36   2 marks

Identify the domain and range of the following function:

$$f(x) = \frac{3}{x^2 + 1}$$

Evaluate:

$$\csc\left(\frac{11\pi}{6}\right) + \sin^2\left(-\frac{3\pi}{4}\right) + \cos\left(\frac{23\pi}{3}\right)$$

Evaluate the coefficient of the term containing x^3 in the expansion of $(1+x)^7$.
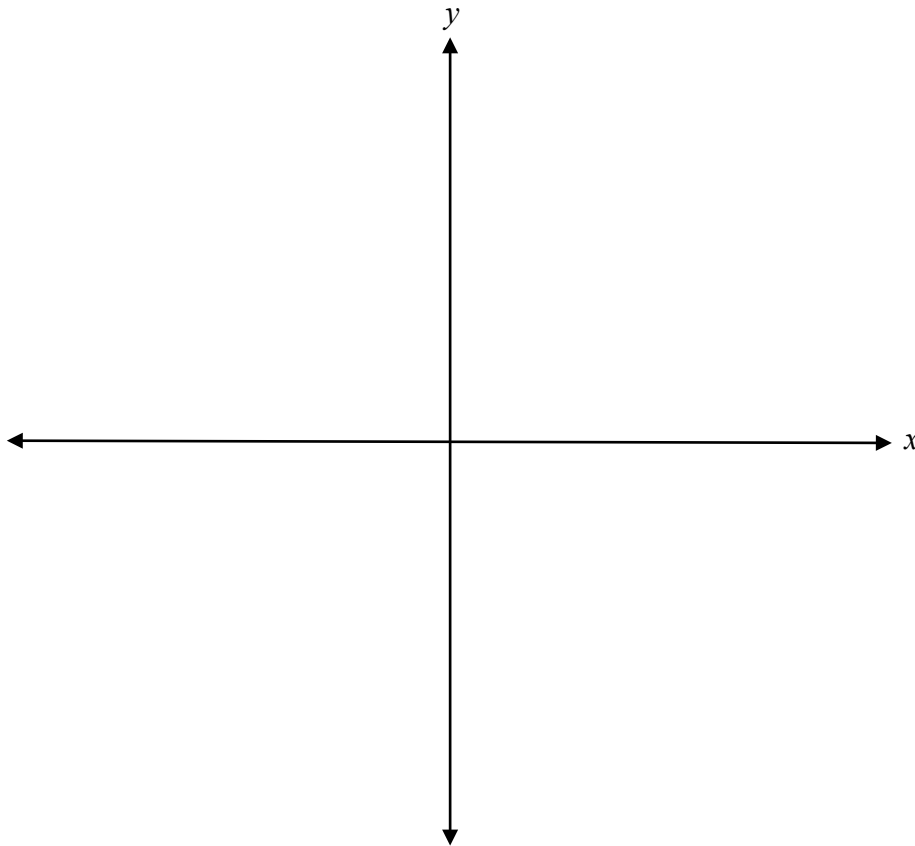
Justify your answer.

Which of the following equations could be solved without the use of logarithms?

Without actually solving the problem, explain your choice.

$$4^x = 10^{3x+1} \qquad \text{or} \qquad \left(\frac{1}{3}\right)^{2x+1} = 27^{4x-1}$$

Sketch the graph of $y = x^3 + x^2 - 5x + 3$ given that one of the x-intercepts is 1.

Identify the x-intercepts and y-intercept.

Question 41   1 mark   135

If $f(x) = \dfrac{1}{x-2}$ and $g(x) = x-2$, what is the domain of $f(x) \bullet g(x)$?

Question 42   2 marks   136
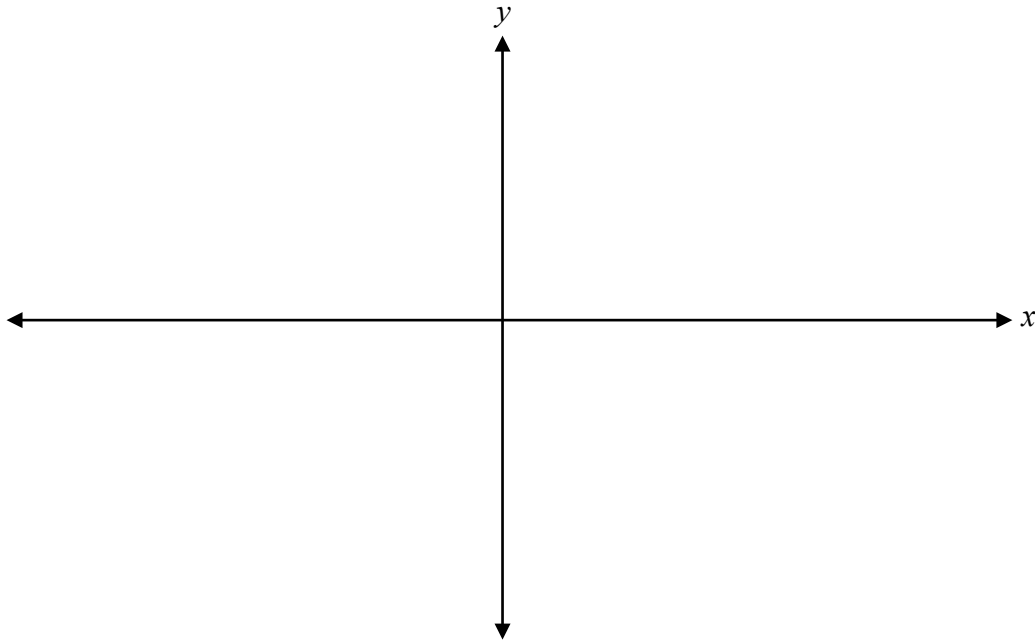
Given $f(x) = (x+1)^2$ for $x \leq -1$, write the equation of $y = f^{-1}(x)$.
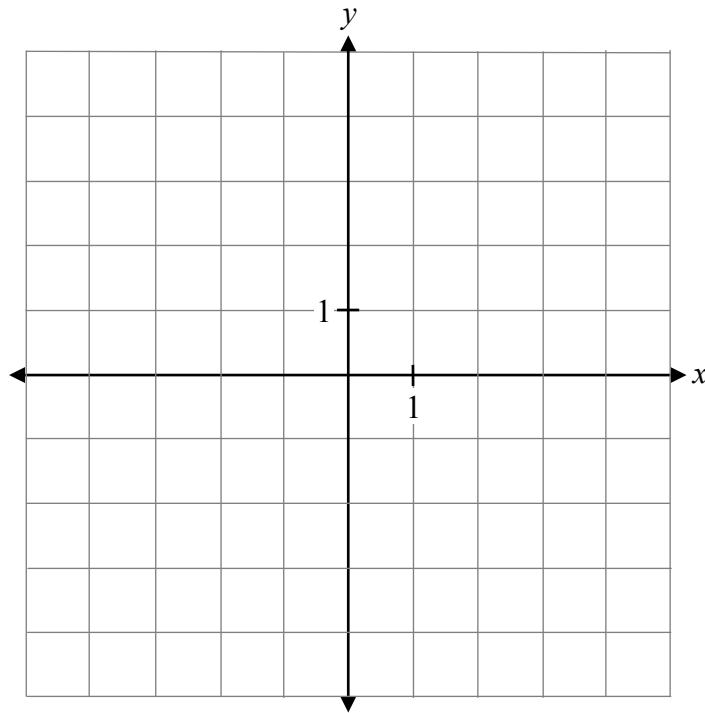
Sketch a graph of at least one period of the function $y = 5\sin\left[\pi(x+1)\right]$.
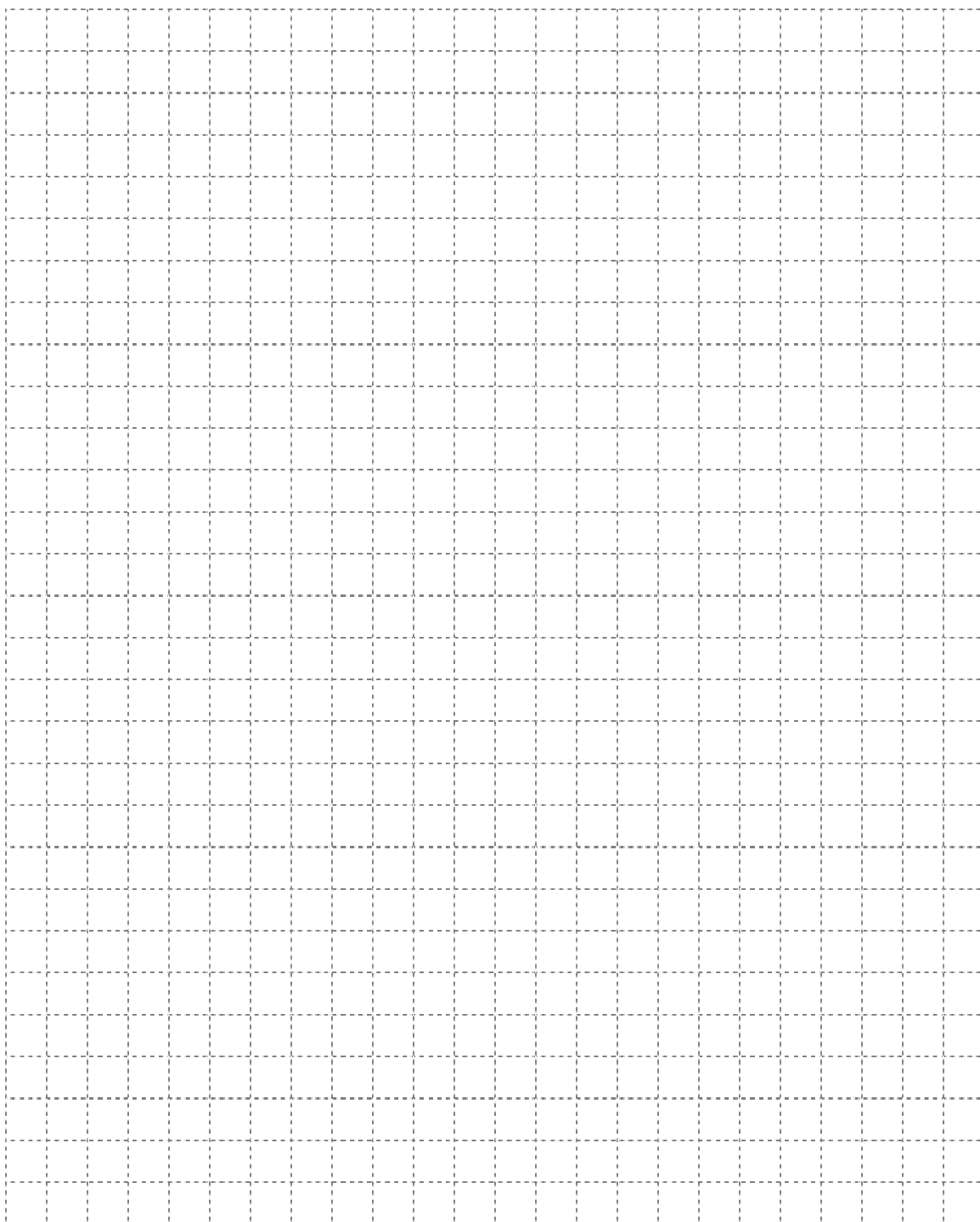
Clearly indicate the *x*-intercepts.

Sketch the graph of the following function:

$$f(x) = \frac{x-2}{(2x-3)(x-2)}$$

No marks will be awarded for work done on this page.

No marks will be awarded for work done on this page.

No marks will be awarded for work done on this page.